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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/544,133

08/02/2005

Takeshi Azami

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EXAMINER

MCCRACKEN, DANIEL

ART UNIT

PAPER NUMBER

1793

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11/18/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/544,133	<b>Applicant(s)</b> AZAMI ET AL.	
	<b>Examiner</b> DANIEL C. MCCracken	<b>Art Unit</b> 1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 06 July 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

### ***Status of Application***

Applicants response dated 7/6/2009 has been received and will be entered. Claims 1-14 are pending with Claims 3, 10 and 11 currently amended.

### ***Response to Arguments***

#### **Claim Rejections – 35 U.S.C. §112**

I. With respect to the rejection of Claims 3 and 10-11 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, Applicants traversal is on the grounds that the claims as amended obviate the rejection. (Remarks of 7/6/2009 at 7). No additional analysis was provided. This is not necessarily persuasive because (as developed *infra*), the amended language lacks clarity. For example, Claim 3 states “so as to reverse to reverse the upper and lower orientation of said surfaces relative to one another.” To “reverse” something and then to “reverse it again” is to end up back where the “thing” started. This language was not understood. With respect to Claim 10, again, the “reversing the orientation” language is not clear. These

Art Unit: 1793

distinctions matter: Are Applicants rotating the target in an angular direction (*i.e.* spinning it?) or are they “flipping” the target much as one would flip a record on a turntable to listen to the second side? Or is some entirely different meaning contemplated? As drafted, the claim makes no such distinction, and it is not understood which distinction is being presented in light of the disclosure. As to Claim 11, again – what does this limit? Are Applicants describing the rotating target, or is the laser moving with respect to the target? Multiple rotations, movements, etc. are disclosed. *See e.g.* (S. “Figures”).

#### Claim Rejections – 35 U.S.C. §103

I. With respect to the rejection of Claims 1-13 under 35 U.S.C. 103(a) as being unpatentable over WO 98/39250 to Smalley, et al. and Ullmann, et al., *Nanoparticle formation by laser ablation*, J. Nanoparticle Research. 2002; 4: 499-506 (hereinafter “Ullmann at \_\_”) in view of US 5,587,141 to Ohshima, et al., Applicants traversal is narrative and fails to comply with 37 C.F.R. 1.111(b), which requires the response to “point[] out the specific distinctions believed to render ***the claims***, including any newly presented claims, patentable over any applied references.” (emphasis added). Applicants do not discuss a single claim in their response, making evaluating Applicants remarks very difficult. Applicants state:

The Office Action notes a teaching to alternate the laser beams so as to change the angle of incidence and avoid "deep" pitting of the target surface, but ***then tries to interpret this teaching as suggesting the avoidance of all pitting of the surface.*** That attempt makes no sense because the very purpose of the laser is to cause removal of a part of the surface which, since it results in a pit being formed, pitting cannot be avoided even if deep pitting might be.

Art Unit: 1793

(Remarks of 7/6/2009 at 7) (emphasis added). This misstates the Office Action. The Office Action actually stated:

Note here the teaching of Smalley which states “alternating [the laser beam] from the left to the right side of the drum so as to change the angle of incidence on the target surface to avoid deep pitting.” (Smalley 76: 24-26) (emphasis added). This suggests that pitting of the target by the laser is to be avoided. Note also Ullmann would appear to recite a similar teaching. Ullman likewise employs a laser ablation apparatus with collection chambers and a rotating target. (Ullman at 502 “Fig. 1”). Ullman states “[c]ontinuous irradiation leads to a quasi steady state, because the surface conditions do not change further by more irradiations. Only fractions of a milligram are removed causing the groove to stay shallow and present a similar surface for hours of operation.” (Ullman at 502, col. 2).

(Non-final Office Action dated 4/9/2009 at 4). Nowhere does the Office Action state that the avoidance of *all pitting* of the surface is to be avoided. This flat out mischaracterizes the passage quoted above. Furthermore, Applicants appear to recognize the real teaching of Smalley (which was quoted to them in the office action), namely that *deep pitting* (not *all pitting*) is to be avoided. *Of course* some “pitting” of the target will occur. This is the very nature of the reaction, dating back to the discovery of fullerenes in 1985. Energy (*i.e.* a laser) is directed at a target (*i.e.* graphite) and nanocarbons (fullerenes, nanotubes, etc.) are generated. Another way of stating this is “matter and energy are conserved.” Of course part of the surface is removed. It is converted (with energy) from one allotrope of carbon (graphite) to another (fullerene, etc.). This is how the reaction works. Applicants are respectfully requested to indicate where the Office Action stated “all pitting” is to be avoided, so that a proper reply can be articulated. The arguments set forth in the response “make[] no sense” for the reasons noted above. The remainder of the arguments are narrative, and as noted above, do not mention a single claim, making it difficult if not impossible

Art Unit: 1793

to discern what Applicants are arguing. The arguments are a piecemeal treatment of the references. Applicants – without mention of a single claim - focus on distinctions that were acknowledged in the office action. *Compare e.g.* (Remarks of 7/6/2009 at 8) (“But Ohshima does not relate to a laser procedure and instead is based on applying voltage between a carbonaceous anode and a cathode to cause a discharge from the anode to occur.”) *with* (Non-final Office Action dated 4/9/2009 at 4) (“Ohshima teaches what is generally referred to in the art as an “arc discharge” method for making fullerenes.”). Whatever repeating what was stated in the office action was supposed to convey, it was not understood. To the extent it was intended as a “non-analogous” art type argument, this is hardly persuasive. One of ordinary skill in the art would be well familiar with each technique (laser ablation, arc discharge, chemical vapor deposition). Applicants continue to make arguments to the effect that “Nothing in Ohshima teaches or suggests the smoothing of any surface from which carbon has been removed.” (Remarks of 7/6/2009 at 9). How is the doctor blade of Ohshima any different than “cutting tool 105” (S. 16: 4). Isn’t this what causes the “smoothing?” What do Applicants mean by “smoothing?” Are there translation issues present here that the Examiner is not aware of? Inasmuch as an argument could be discerned (note again that absolutely no claims were discussed, precluding a proper “relevance” analysis to the remainder of the narrative remarks), the arguments were not persuasive for at least the reasons noted above. The rejection is MAINTAINED, updated to account for amendments.

**II.** With respect to the rejection of Claims 1-14 under 35 U.S.C. 103(a) as being unpatentable over Smalley, Ullmann and Ohshima as applied to claims 1-13 above, and further in view of Iijima, et al., *Nano-aggregates of single-walled graphitic carbon nano-horns*,

Art Unit: 1793

Chemical Physics Letters 1999; 309: 165-170 (hereinafter "Iijima at \_\_\_"), Applicants traversal is again narrative and fails to mention a single claim. Applicants rely on their prior "analysis" of the references, which as noted above, was not understood, not persuasive, or some combination thereof. The rationale and motivation articulated in the rejection was not traversed. The Examiner presumes the analysis was correct. The rejection is MAINTAINED, updated to account for amendments.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

**I. Claims 3 and 10-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

With respect to Claim 3, the "so as to reverse to reverse" language is not understood. Do Applicants intend language that describes a component that - in light of the language – does not change position at all? With respect to Claim 10, the “reversing the orientation” language is not clear. See remarks in Response to Arguments *supra*. Claim 11 is not understood - specifically what the “irradiation position of light in said irradiating the surface of the graphite target with light and in said irradiating the graphite target with light again [*sic*]” is supposed to limit. What is moving - the laser or the target?

### ***Claim Rejections - 35 USC § 103***

Art Unit: 1793

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

**I. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 98/39250 to Smalley, et al. and Ullmann, et al., *Nanoparticle formation by laser ablation*, J. Nanoparticle Research. 2002; 4: 499-506 (hereinafter “Ullmann at \_\_\_”) in view of US 5,587,141 to Ohshima, et al.**

With respect to Claim 1, Smalley teaches an apparatus with a light source (*i.e.* a laser) and a cylindrical carbon rod. (Smalley 76: 17-27). Given that Smalley recites the subsequent treatment of the nanotubes (*i.e.* a species of “nanocarbon”), it is expected that a “collection unit” is necessarily disclosed, as the nanotubes were in fact “collected.” *See* (Smalley 76: 28 *et seq.*). Note here the teaching of Smalley which states “alternating [the laser beam] from the left to the right side of the drum so as to change the angle of incidence on the target surface *to avoid deep pitting.*” (Smalley 76: 24-26) (emphasis added). This suggests that pitting of the target by the laser is to be avoided. Note also Ullmann would appear to recite a similar teaching. Ullman likewise employs a laser ablation apparatus with collection chambers and a rotating target. (Ullman at 502 “Fig. 1”). Ullman states “[c]ontinuous irradiation leads to a quasi steady state, because the surface conditions do not change further by more irradiations. Only fractions of a milligram are removed causing the groove to stay shallow and present a similar surface for hours of operation.” (Ullman at 502, col. 2). While Ullman would appear to discuss the formation of metal particles, note the various passages of Ullman reciting the formation of carbon particles (*i.e.* “nanocarbon”). *See e.g.* (Ullman at 503, “Table 3”). Thus, there would appear to be a clear teaching and suggestion in the prior art that a uniform target is desirable or that “pitting” of the target by the laser is to be avoided. To the extent neither Smalley nor Ullmann teaches the



Art Unit: 1793

“surface process unit for flattening the surface” as claimed, Ohshima does. Ohshima recites an apparatus and method for making fullerenes (*i.e.* a species of “nanocarbon”). Ohshima teaches what is generally referred to in the art as an “arc discharge” method for making fullerenes. Like the laser ablation techniques of Smalley and Ullman, energy is delivered to a carbon target, but with arc discharge the energy is delivered via an arc between an anode and cathode. *See generally* (2: 40 *et seq.*). Like Smalley and Ullman, Ohshima employs a rotating target. *See e.g.* (Ohshima 3: 9-14). Ohshima employs a “scraping member” (*i.e.* a surface process unit for flattening the surface). *See* (Ohshima 3: 27-31; 4: 19-25; 5: 28-31). Note that this scraping member bears a striking resemblance to those disclosed in the instant application. *Compare e.g.* (Ohshima “Figs. 2-4”) *with* (S. “Fig. 2”). Ohshima would appear to present a corollary of the teachings of Smalley and Ullman by stating “the carbonaceous deposits are scraped by the blade 8 and collected in the bottom of the chamber *so that the arc discharge can smoothly continue.*” (Ohshima 4: 20-22) (emphasis added). One would be motivated to add the scraping member of Ohshima to the laser ablation devices taught by Smalley and Ullmann to remedy the pitting issues noted above. Alternatively, one would be motivated to substitute a laser as taught by Smalley or Ullmann for the anode of Ohshima as a laser would provide for a more continuous mode of operation. Note that in the arc discharge process, the process must be stopped when the anode is consumed. *See* (Ohshima 5: 32-33) (“The feed of DC current was stopped when the anode 6 was consumed.”). Substitution of a laser would allow for elimination of this step of stopping to replace the anode. As to Claim 2, Smalley teaches rotating about an axis. (Smalley 76: 20). As to Claim 3, notwithstanding the ambiguities noted above, Smalley recites alternating the angle of the laser (Smalley 76: 24-26) and Ohshima recites “normal” configuration (Ohshima

Art Unit: 1793

3: 40) as well as other arrangements of the target relative to the cathode. (Ohshima “Figs. 2-4”). With respect to the newly added “reversing the reversed” language, one of ordinary skill in the art would recognize any sequence of steps that arrives at the original configuration as an obvious expedient. As to Claim 4, Smalley teaches rotating the target, ergo Smalley discloses a “movement unit.” (Smalley 76: 20). To the extent Smalley doesn't teach a “movement unit,” note that Ohshima teaches a “driving mechanism 5 including an electric motor for rotating the shaft.” (Ohshima 3: 12-14). As to Claim 5, note the above discussion of the scraping member. Ohshima recites the scraping member as “a blade whose edge 8a is maintained in contact with the cathode [carbon/graphite] surface 2a.” (Ohshima 29-31). As to Claim 6, see above discussion of “collection unit” in Smalley. To the extent Smalley (which recites treating the collected nanomaterial) does not teach a collection unit, note that both Ullmann and Ohshima do. *See* (Ullmann at 502 “Fig. 1”) *and* (Ohshima 4: 45 *et seq.*). As to Claim 7, the “nanohorn aggregate” language is being interpreted as a statement of intended use. Claim 1 (from which Claim 7 depends) is an apparatus claim. “[A]pparatus claims cover what a device is, not what a device does.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original). Here, making the nanohorn aggregate is what the apparatus does, not what it is, which is the laser, target, etc. addressed above.

With respect to Claim 8, the preceding discussion of Claim 1 is relied upon. As noted above, Smalley, Ullman and Ohshima all employ rotating graphite targets. As noted above, Ohshima teaches the flattening unit and subsequent treatment with the anode. Substitution of a laser is an obvious expedient (as noted above) to eliminate the need to replace the anode. As to Claim 9, note that Smalley teaches a graphite rod. (Smalley 76: 19) (“2.5 cm by 5 cm cylindrical

Art Unit: 1793

carbon target). As to Claim 10, notwithstanding the ambiguities noted above, Ohshima would appear to teach the rotational configuration. *See e.g.* (Ohshima “Figs. 2-4”). As to Claim 11, notwithstanding the ambiguities noted above, it would appear as if Smalley and Ullmann both teach repeated irradiation of the target due to the rotation described. *See* discussion of Claim 1 *supra*. Smalley likewise teaches movement of the laser. (Smalley 76: 23-24). To the extent some different movement was intended, note that Ohshima teaches various configurations of moving the anode relative to the cathode that would be desirable for utilizing the maximum surface of the cathode target. (Ohshima 3: 46-54). As to Claim 12, given the scraping member of Ohshima is in contact with the target, it is expected that part of the surface is removed. (Ohshima 3: 31). As to Claim 13, lasers are taught. (Smalley 76: 22).

**II. Claims 1-14 rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley, Ullmann and Ohshima as applied to claims 1-13 above, and further in view of Iijima, et al., *Nano-aggregates of single-walled graphitic carbon nano-horns*, Chemical Physics Letters 1999; 309: 165-170 (hereinafter “Iijima at \_\_”).**

The preceding discussion of Smalley, Ullmann and Ohshima accompanying the obviousness rejection *supra* is expressly incorporated herein by reference. To the extent Smalley, Ullmann and Ohshima *may* not have disclosed graphite targets (Ohshima did at *e.g.* 2: 64), Iijima does. *See* (Iijima at 166, col. 1) (“graphite target rod”). Note also that Iijima would appear to employ a laser ablation apparatus/method with a rotating target. *Id.* Likewise, to the extent Claim 7 requires nanohorn aggregates and with respect to Claim 14, to the extent neither Smalley, Ullmann or Ohshima disclosed making “nanohorn aggregates,” Iijima does. *See e.g.* (Iijima “Abstract”) (“An individual particle is composed of an aggregate of many horn-shaped sheaths of

Art Unit: 1793

single-walled graphene sheets, which we named carbon nano-horns.”). One would be motivated to substitute the graphite target of Iijima with the doped graphite targets of Smalley, etc. to make carbon nanohorns for any number of reasons, for example the heat resistive properties of carbon nanohorns taught by Iijima at (Iijima at 170, col. 1-2).

### ***Conclusion***

The following is considered relevant to Applicants disclosure:

1. Rinzler, et al., *Large-scale purification of single-wall carbon nanotubes: process, product, and characterization*, Applied Physics A 1998; 67: 29-37 – see especially page 30.
2. US 5,300,203 to Smalley – see e.g. (Smalley 8: 20 *et seq.*) (describing rotating the target and noting that “even vaporization of the surface of [the] target” is desirable, a corollary of the teachings discussed in previous office actions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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